Chapter 3

The baseline programs identified in Chapter 2 represent current program plans for managing nuclear materials. This chapter identifies ways the Department can improve management of these materials, by improving coordination and integration of responsibilities for treatment, storage, and disposition among program offices, while cutting costs and achieving other efficiencies. Opportunities identified are divided into two categories:

- *Policy and Organizational Changes* — immediate actions to strengthen policies and organizational efficiency related to the management of nuclear materials.
- *Improving Operations* — near-term improvements for managing materials, focused primarily on integrated assessments of plutonium stabilization, storage, and disposition needs, and the need for processing and consolidated storage of HEU.

The Department will continue to look for additional opportunities in both of these areas.

Policy and Organizational Changes

These actions continue a series of major management reforms of the Department's field operations that were directed by the Secretary on April 21, 1999. The Department established a Lead Program Secretarial Officer management structure under which each field operations office reports to a Headquarters program office. The Secretarial Officers were given clear lines of authority to oversee field office operations and they are held accountable for implementing Department policies at these facilities. The Secretary also established the Field Management Council, led by the Deputy Secretary and Chief Operating Officer of the Department, to coordinate development and implementation of policies affecting field operations. Operations and Field Office Managers were made responsible for all site programs and for project execution, contract management, and facility operations oversight.

On May 11, 1999, the Secretary directed a reorganization to address heightened concerns about the security of the Department's nuclear weapons program. These reforms included the establishment of a new Office of Security and Emergency Operations that is responsible for developing and implementing Department-wide safeguards and security policy, computer security, and emergency operations functions. The Office of Plutonium, Uranium, and Special Nuclear Materials was established within the Office of Security and Emergency Operations to strengthen the Department's focus on materials control and accountability.

On March 1, 2000, the NNSA became operational. It is led by the Under Secretary for Nuclear Security/Administrator for Nuclear Security, while the Under Secretary for Energy, Science and Environment oversees the three other business lines. The respective organizational responsibilities of each Under Secretary are fully represented in the chart located in Appendix III. Clearly, offices with major nuclear materials responsibilities have oversight from both Under Secretaries, emphasizing the important role of nuclear materials in both civilian and national security missions. For this reason, the new NNSA will be an integral part of the Department's efforts to coordinate nuclear materials management.

Launching the Nuclear Materials Stewardship Initiative

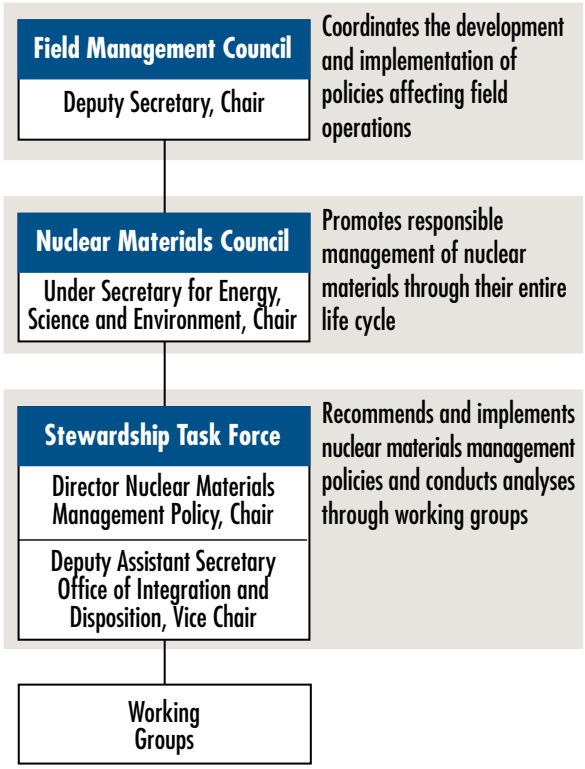
The Department's Field Management Council considered issues concerning nuclear materials management in a September 1999 meeting and concluded that a more focused and integrated Departmental effort should be undertaken for nuclear materials management. The Under Secretary, a member of the Field Management Council, was tasked to lead the effort. The Under Secretary convened all principal Secretarial Officers with responsibilities for nuclear materials to form a Nuclear Materials Council (NMC). The Council completed the charter for the NMSI in January 2000 (see Appendix IV).

NMSI's overall mission is to promote responsible management of nuclear materials through their entire life cycle, from production through ultimate disposition. By cutting across all Departmental program elements, NMSI integrates nuclear materials management responsibilities in order to:

- develop a corporate strategy for nuclear materials management;
- monitor safeguards and security and safety capabilities;
- identify and evaluate opportunities for improved management;
- optimize planning for future requirements;
- address and resolve cross-program issues;
- promote international best practices; and
- reduce overall long-term costs.

The NMC guides and oversees the work of a Stewardship Task Force that carries out the Initiative. The Task Force consists of a senior management-level appointee from each line program with nuclear materials management responsibilities, as well as representatives from the Office of Environment, Safety and Health; Comptroller; General Counsel; and Policy. The Director of a newly established Office of Nuclear Materials Management Policy in the Office of Policy chairs the Task Force. The Deputy Assistant Secretary of the Office of Integration and Disposition in EM serves as the Task Force Vice Chair. The opportunity exists to add a second Vice Chair from the NNSA. The Task Force recommends policies and actions and conducts analyses and studies through working groups composed of program, field, laboratory, and contractor representatives, as needed. Figure 3-1 depicts the organizational structure for the Initiative.

Figure 3-1 Organizational Structure for the Nuclear Materials Stewardship Initiative.



Nuclear Materials Stewardship Initiative

- Nuclear security and strategic reserve materials shall be stored and maintained in a state of readiness.
- Surplus nuclear materials shall be dispositioned in accordance with national nonproliferation policy and international treaties and agreements, and relevant U.S. statutes.
- Other nuclear materials shall be kept as national resources and placed in safe storage or disposed of as waste in accordance with national nonproliferation policy and international treaties and agreements, and relevant U.S. statutes.
- Robust nuclear materials management capabilities shall be available in safe and efficient facilities to support Departmental missions, and the nation's security, economic, and environmental quality objectives.
- A world-class scientific and technical workforce shall be maintained to perform the wide range of functions required for safe and efficient stewardship of nuclear materials.
- Credibility for U.S. leadership, influence, and cooperation in nonproliferation, safe use of nuclear energy, and science and technology shall be paramount.

The Initiative's agenda

The NMSI will continue to be the forum for the Department's integrated management of nuclear materials. Below are several tasks that will be undertaken for this Initiative. The agenda will be regularly reviewed and adjusted as needed.

Task 1: Prepare an Integrated Nuclear Materials Management Plan — This Plan satisfies the requirements of Section 3172 of the National Defense Authorization Act for FY 2000. It advances the Council's agenda and is the first action scheduled for completion in calendar year (CY) 2000.

Task 2: Address high-priority, cross-program issues — Resolution of these issues will eliminate roadblocks to integration and foster corporate decision making. The Council and Task Force will make planning decisions concerning a set of high-priority, cross-program issues that are barriers to an individual program's successfully meeting its mission obligations. Actions on these issues will be scheduled throughout CY 2000, subject to the requirements of NEPA. Several cross-program working groups are undertaking this task. A list of more than 40 cross-program issues has been developed based on inputs from Headquarters and Operations Offices. A description of some priority issues follows:

- *Americium, curium and plutonium-244 (Pu-244) as national resource materials* — The NMC is considering a recommendation to recategorize the tank 17.1 solutions at SRS as surplus materials. If no formal action has been taken to specify a programmatic need for the materials by the time they have been processed, the Department would proceed under NEPA to analyze disposal options. The Mark 18A targets are still under review by the NMC to determine whether they should be kept as national resource materials to allow future recovery of the Pu-244 that they contain. The NMC has scheduled completion of its review and expects to make a decision on the use of these materials by the Summer of 2000.
- *Disposition of U-233 and Np-237* — A decision is needed on whether to retain U-233 and Np-237 as a national resource or dispose of it. Interim issues of management responsibility, storage location, and disposition strategy must also be addressed.
- *Disposition of cesium and strontium* — The Department possesses over 9,000 cesium/strontium items, containing over 71 million curies. Current disposition plans address only about 2,000 items. The remaining items do not have disposition paths and may impact facility and site closure plans and costs.
- *Disposition of Pu-contaminated HEU* — Parts exist at Rocky Flats Environmental Technology Site (RFETS), Y-12, LANL, and LLNL requiring temporary storage pending decisions on ultimate disposition.
- *Cost Sharing for use of services, facilities, or processes* — In some cases, landlord programs subsidize tenant program activities at the expense of landlord mission work. Transportation Safeguards Division (TSD) services are an example. Though operated by DP, other programs such as EM and MD will require substantial TSD support in the future. Alternative funding and shared-cost arrangements will be analyzed by the NMC.

Task 3: Analyze strategic information management system integration options — The NMSI will develop an approach for upgrading and integrating systems for nuclear materials information management and inventory accountability. This will link corporate nuclear materials management and planning needs with inventory accountability requirements. The Department's nuclear materials information system should more effectively support the needs of materials management, life-cycle planning, and disposition. Information technology will minimize redundant databases while accounting for all nuclear materials and nuclear waste at a level of assurance commensurate with the risks they pose.

Task 4: Develop and revise Department Orders, policies, and planning documents, as appropriate — This task will institutionalize changes in management practices and policies that will further integration. Since the chartering of the NMSI, a number of opportunities have been identified for improving the Department's business practices. The Department will, as appropriate, seek public participation in developing these policies.

The following subtasks are included:

- *Subtask 4.1 — Develop/revise Departmental Orders and policies as appropriate*. This could include developing a new Departmental Order on Management of Nuclear Materials (Departmental Policy and Order 5660.1B). Although most program offices now have nuclear materials stewardship responsibilities, a new Order would identify the scope and requirements of a comprehensive, integrated Departmental nuclear materials stewardship program and assign and describe the responsibilities of each program and support element, including an NMSI coordinating function.
- *Subtask 4.2 — Clarify ownership of national resource material.* The Department will prepare a strategy document, coordinated by NE, that will define the technical and infrastructure acceptance criteria, programmatic requirements, and resources needed to enable the transfer of certain nuclear materials to the Department's civilian nuclear energy program. For nuclear materials with clearly identified civilian program uses or those that have been designated as national resources, this strategy document would provide, on a case-by-case basis,

guidance as to which materials could be accepted for management by NE and under what conditions they could be accepted. This strategy document will be completed in time to enable the Department to consider budgetary initiatives in FY 2003.

- *Subtask 4.3 — Establish "national resource materials" policy*. This task will address the issue of whether the Department should retain certain unique nuclear materials as national resources to ensure their availability for future scientific or programmatic use. It will also assess the comparative costs of storing, disposing of, or replacing them at some future date. The portions of the existing supplies that should be retained will be systematically identified, along with the infrastructure needed to store and process the isotopes into their intended forms. To determine what materials should be kept for national needs, the Department is applying the following criteria:

  – *Producibility*. Only materials that require extraordinary time and resources to produce and that cannot be easily replaced will be considered for long-term retention.

  – *Need.* The quantities of material to be retained will be determined by identifying potential needs with additional material reserved for unidentified needs. Potential needs should be categorized and prioritized as follows: (1) uses for which the material is unique and for which there are no practical substitutes, (2) known future uses, and (3) other potential uses.

  – *Inventory quality*. The cost to produce unique materials and their potential uses usually depends upon their isotopic purity. Isotopic purity, material stability, and cost of recovery will be explicitly considered in determining which materials to retain and which to dispose of.

  – *Retention analysis*. The costs of the various options for management of the materials will be considered for their complete future life cycle, including the costs of long-term storage and/or disposal. These estimates will include consideration of associated stabilization, other required processing, extraction (to make the material usable), transportation, and availability of containers and facilities for various phases of management. It is also appropriate to offset costs with income (if any) that the Department might receive due to future use of the materials. Major cost elements that cannot be estimated due to lack of information will be clearly identified for consideration by management.

  This draft policy is being tested through analysis of "keep versus toss" decisions for americium, curium, and U-233. The draft policy will be modified as appropriate based on lessons learned from these examples.

Task 5: Convene a cross-program team to integrate planning for the disposal of defense high-level nuclear waste and Department-owned spent nuclear fuel in a repository and to address safeguards and security licensing requirements — The Department's Draft Strategic Plan calls for a decision in FY 2001 by the Secretary on whether or not to recommend Yucca Mountain as the site of a geologic repository. Current schedules call for the start of repository operations in 2010 if the site is determined suitable by the Secretary, the recommendation is approved by the President and Congress, and the repository is licensed by the NRC. A key requirement is to fully integrate into the repository baseline and planning process the disposal of the Department's high-level nuclear waste, Department-owned spent nuclear fuel generated by nuclear weapons production and the Naval nuclear propulsion program, Department-owned civilian nuclear research and development materials and weapons-capable fissile materials.

Integrated Planning

Such integration offers opportunities to reduce the complexity, costs, and impacts of the management of these materials across the Departmental complex in a number of ways. For example, many of the defense nuclear materials destined for a geologic repository will require interim processing and storage before emplacement. Selecting appropriate processing and storage measures requires knowing what the waste acceptance criteria for the repository will be, so that the processing and packaging of these materials are compatible with the criteria.

Careful coordination of near-term treatment and storage decisions with repository planning could reduce the risk that additional processing steps would be required to put the materials in a form suitable for transportation to and disposal in a repository, thereby avoiding additional costs and worker exposures. On the other hand, further analysis may show that currently planned treatment activities are unnecessary for safe disposal. Since the NRC makes the ultimate determination of what waste forms are acceptable for disposal, careful coordination with decisions concerning licensing can play an important role in realizing potential system benefits.

As another example, large quantities of metals will result from the decommissioning of the Department's nuclear facilities. Some of these metals, such as nickel, might be usable in the engineered barriers of the repository system. Management of these materials could be affected by decisions concerning such possible use.

Once a repository is operating, system-wide integration of plans and schedules for delivery of Department-owned spent

nuclear fuel and defense wastes to the repository could lead to cost savings in several ways. Careful sequencing of delivery schedules to a repository could avoid the need for new storage facilities at other sites, increase management flexibility by freeing up existing storage capacity for other uses, or even allow early shutdown and decommissioning of some facilities through removal of relatively small quantities of material.

The Department will conduct a top-level analysis of HLW and spent fuel management integration that will:

- identify linkages among decisions concerning interim management of nuclear materials destined for a repository and current plans for determining the suitability of Yucca Mountain;
- identify opportunities to reduce system cost, avoid unnecessary processing steps, and maximize the compatibility of interim actions with the requirements for disposal;
- identify crosscutting repository-related issues whose early resolution would provide the greatest benefit to interim management of nuclear materials; and
- conduct an integrated programmatic risk analysis to assess the consequences of, and mitigating measures for, delays in availability of a repository.

Safeguards and Security Considerations

The RW approach to implementing safeguards and security at a monitored geologic repository is based on obtaining licensing for a facility that complies with NRC physical protection requirements in 10 Code of Federal Regulations (CFR) Part 73.51 that addresses acceptance of commercial spent nuclear fuel and vitrified HLW. Embedded in this regulatory approach is the fundamental premise that these materials will be unattractive from the standpoint of theft. Many candidate materials being considered for disposal at a monitored geologic repository have characteristics that are very different from commercial spent nuclear fuel and vitrified HLW. Successfully licensing a repository under 10 CFR Part 73.51 will therefore require a demonstration that candidate materials are no more attractive from a theft standpoint than commercial spent nuclear fuel or vitrified HLW and, thus, are adequately protected.

From a licensing perspective, four characteristics are important to demonstrating the unattractiveness of a candidate material from the standpoint of theft:

- size, including overall weight;
- fissile material content;
- relative difficulty of separation; and
- homogeneity and concentration of special nuclear material content.

A candidate material may be processed or packaged so as to satisfy the regulatory requirements inherent in a 10 CFR Part 73.51 approach to repository licensing. Once a candidate material is accepted for disposal, RW may apply additional specific institutional measures at a monitored geologic repository that protect it at an appropriate level, thereby rendering it even more unattractive.

To implement this approach to safeguards and security at a geologic repository, RW will work with waste owners to evaluate their candidate materials against the four characteristics defined above and document the results of that evaluation.

While individual candidate materials may have characteristics, such as radioactivity, that may normally be considered barriers to proliferation, these characteristics will not be utilized as part of the RW licensing approach to safeguards and security at a monitored geologic repository. This conservative approach recognizes that, with the passage of time, the radioactivity of a material decreases, thereby diminishing its effectiveness as a barrier.

Task 6: Establish a corporate level process for facilities strategic planning and decision making — A Department-level process for making decisions about facility commissioning, use, and closure will be evaluated to support the material management capability requirements of the future. This planning process will be comprehensive and institutionalized and will:

- take a systems approach that focuses on both current and future Department-wide functional requirements rather than on individual materials and program needs (this will move the complex in the direction of optimizing the use of existing facilities, assuring that future closures make "system sense," and maximizing the benefits to be gained from future facility investments);
- focus on life-cycle planning that identifies the alternatives and costs of taking a material through to reuse or disposal (this includes sensitivity analyses to account for uncertainties);
- identify capabilities of facilities now in the system and assess their condition; and
- determine the need for new or replacement capabilities to meet future requirements.

Ultimately, the processes could include the following elements:

- a system for maintaining information on facility capabilities, status, and schedules;
- a mechanism for matching material processing needs with facility capabilities;

- a system for modeling and improving facility infrastructure with respect to safety, cost, and national security; and
- a baseline modified through configuration management procedures.

Task 7: Undertake an analysis of the long-term capabilities required by the future nuclear materials complex — Decisions made about the nuclear materials complex in the near-term will have long-term consequences. These decisions must be integrated into a Departmental strategy for maintaining an enduring nuclear materials stewardship mission. The Department must, therefore, extend its planning horizon beyond this decade by applying qualitative and quantitative analysis of long-term requirements. To address the uncertainties inherent in such an analysis, the Department will identify reasonable alternative scenarios that might characterize future uncertainties.

This analysis will maintain the core assumption that the Department is obligated to preserve national security, bolster economic prosperity, and promote U.S. policies. A modern and efficient nuclear materials complex will ensure U.S. leadership in nuclear science and technology.

As the work of furthering the integration of the nuclear materials complex proceeds, the Department will enlarge the information resources it draws on, refine its analytic techniques by using quantitative analyses, and employ decision support tools to ensure a sound foundation for decision making. Moreover, the Department will periodically revisit its assumptions about future requirements in light of changing conditions. Thus, the analyses of long-term requirements for the nuclear materials complex must become an integral part of the Department's dynamic strategic planning process.

Task 8: Analyze whether to consolidate nuclear materials management expertise — Based on experience with the National Spent Nuclear Fuel Program, the Department is considering creation of several nuclear materials management groups. These groups could help maintain the Department's core capabilities and expertise, aid coordination and integration efforts throughout the nuclear materials complex, and support program and field office issue resolution and decision making.

A management group could, for example, dispatch a mobile sample/pack/ship team to small holding sites, closure sites, or sites that lack the capability and resources to sample, characterize, pack, and ship their materials. These groups could be given the responsibility and resources to implement many required activities for a material type. They could support the management of both national security and legacy materials. Because the groups would provide a mechanism for the integrated management and characterization of nuclear materials, costs associated with handling, packaging, transportation, and disposition should be reduced. Although there are unique issues associated with the management of each material, other programs could similarly expect to achieve savings, avoid future costs, or provide special services to sites that are otherwise without the needed expertise.

Experience with National Spent Nuclear Fuel Program

The National Spent Nuclear Fuel Program, located at INEEL, provides centralized planning and quality assurance functions. It is working closely with RW to integrate Department-owned spent fuel into the repository design basis and EIS, and if the site is found suitable, will do the same for the NRC license application.

The National Spent Nuclear Fuel Program has achieved cost avoidance by eliminating redundancies, coordinating technology development and testing programs, and maintaining a single point-of-contact with RW and the NRC.

In the past, most spent fuel was sent to Idaho or SRS for reprocessing, or retained at Hanford. When reprocessing for recovery of nuclear materials ceased, the focus shifted to treatment and storage and development of alternative disposition technologies. Decisions made in 1995 and 1996 established a strategy for regionalized management of Department-owned spent fuel by fuel type. The management of non-aluminum-based spent fuel was assigned to the Idaho Operations Office, with planning and implementation for aluminum-based fuels assigned to SRS. The Idaho Operations Office was also assigned the role of working with RW to effect repository disposal of Department-owned spent fuel.

The National Spent Nuclear Fuel Program has identified many other materials in the Department's possession that may require geologic disposal. These materials are not currently included in the repository proposed action. For example, unirradiated HEU reactor fuels, special isotopes greater than Class C and special case wastes, and lightly irradiated reactor fuel not managed as spent fuel. The National Spent Nuclear Fuel Program, working with other materials management groups, would provide support for characterization and disposition of these other materials that may require geologic disposal.

Potential Benefits of Consolidating Expertise

Establishing management groups responsible for centralized integrated planning by material type offers the Department an opportunity to ensure that all of its nuclear materials are managed from a corporate perspective. The groups would

support management of both national security and legacy materials, providing the following benefits:

- cost avoidances and savings by sharing technical expertise among sites around a strong technical hub,
- reduction of operating costs through improved corporate material and facility planning,
- assurance of the availability and preservation of core competencies for all materials,
- a mechanism for promoting improved multi-program coordination of facility operations,
- consolidated planning and management of each material type,
- improved security and safety by accelerating material deinventory and disposition, and
- support for accelerated site closure.

The creation of nuclear materials management groups for plutonium, uranium, heavy isotopes, and non-actinide isotopes and sealed sources will be evaluated, at potential sites where the groups would be established. Management groups, if established, would be assigned to sites with past experience managing that material and having significant materials management infrastructure. An important consideration will be the cost of developing these groups in relation to their potential benefits.

Improving Operations

The Department has identified and is considering operational changes that could significantly improve its management of nuclear materials. In preparing this Plan, the Department took a bottom-up approach, using several workshops and reviews to help identify specific opportunities for improving its management of plutonium, uranium, spent nuclear fuel, and other nuclear materials. These opportunities, when fully integrated with today's baseline activities, would afford the greatest near-term return on investment and are described in detail below. They fall within the following categories:

- surplus plutonium management, including storage, stabilization, and disposition;
- uranium management, including storage, recovery, and blend-down; and
- issues that "crosscut" material categories, including packaging, transportation, and technology.

The criteria used to select opportunities for further evaluation, and which will be applied in more detailed evaluations, include the following:

- further reduces radiological risk,
- reduces or avoids costs,
- advances integrated management of nuclear materials,
- improves the efficiency and effectiveness of Departmental operations, and
- promotes nonproliferation/arms control.

Some opportunities are ready for implementation. For others, assessments will be conducted to determine their value within the context of existing and planned operations, and to establish the information base needed to support decision making. Decisions will be made through the Department's established decision making processes, including NEPA requirements, as appropriate.

Improving Operations for Plutonium Management

Plutonium programs are currently being reassessed in light of rapidly changing missions involving Science Based Stockpile Stewardship, arms control agreements, legacy cleanup, and implementation of the plutonium disposition mission. DP and EM, for example, are stabilizing plutonium residues to reduce existing safety vulnerabilities. As another example, the Department is reevaluating its plutonium stabilization, storage, and disposition activities for integration opportunities based on the Record of Decision for the Surplus Plutonium Disposition Final Environmental Impact Statement (DOE, 2000a) which designated SRS as a key management site for surplus plutonium disposition. Preliminary assessments of integration options have been conducted and preliminary conclusions are presented in this section. Additional assessment will be necessary over the next 6 months to finalize preferred planning options that could result in cost savings/avoidance and improvements in overall program execution.

Nuclear material operations (including plutonium) are expensive, and the Department operates facilities at Rocky Flats, Hanford, ANL-W, LANL, LLNL, and SRS. There are other sites handling smaller quantities of plutonium as well. In some cases, decisions made at Savannah River have large cost impacts at the other sites. Figure 3-2 depicts the Department's plutonium management activities as they are conducted today.

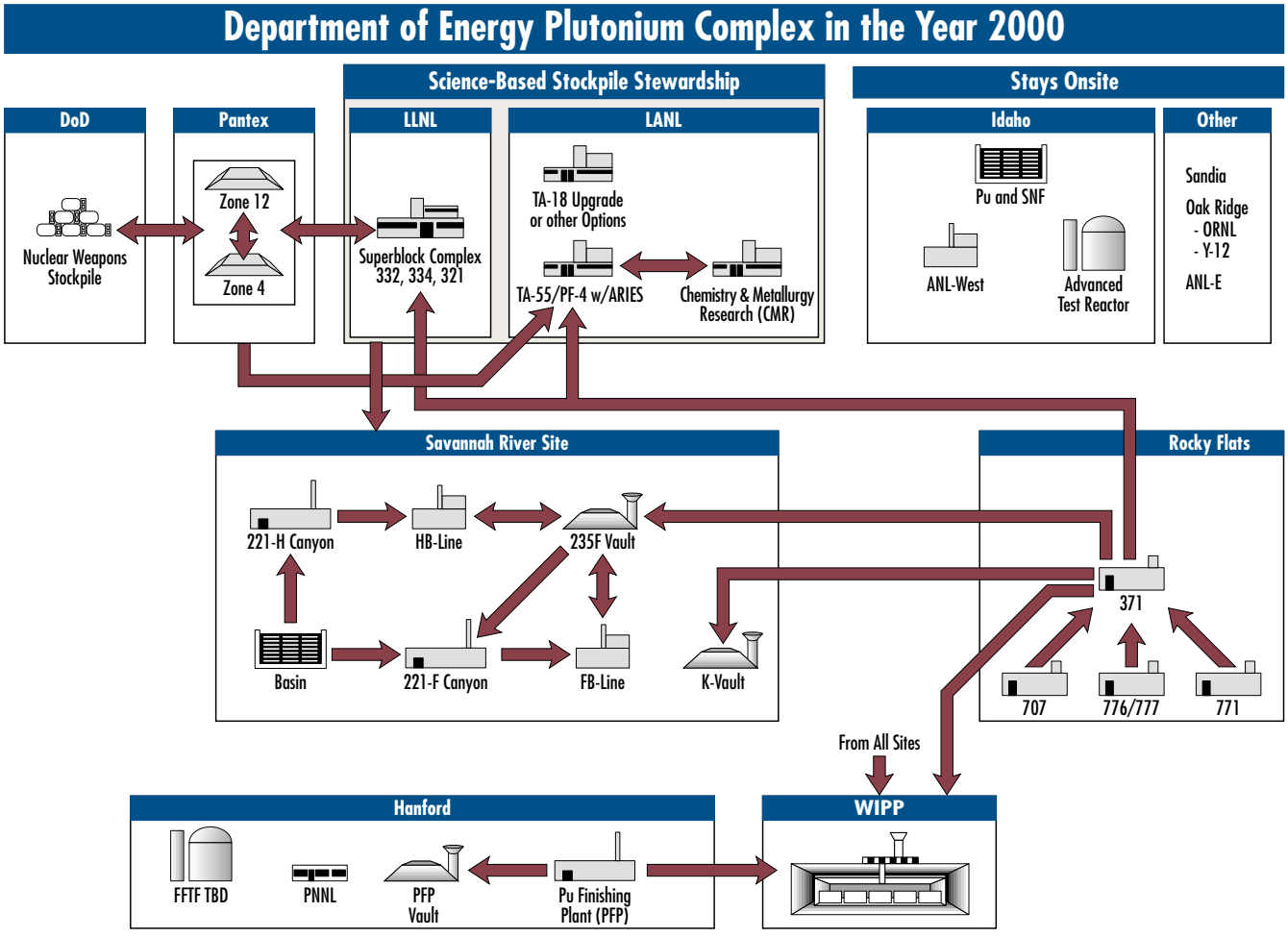
Several specific improvements have been evaluated. These are in the areas of plutonium stabilization and storage. Figure 3-3 depicts how the plutonium complex will look in 2010 with the planned plutonium materials disposition facilities all online, based on current Department planning.

Rough order-of-magnitude projections indicate that the Department could realize a funding shortfall of between 5 and 20 percent during the period of FY 2001 and FY 2006 if funding for the plutonium management operations represented in Figure 3-2 remains constant for the next several years. In light of this possibility, the Department recognizes the importance of identifying opportunities to minimize future costs for managing these materials.

Ways to Improve the Department's Management of Plutonium Stabilization

Stored plutonium poses a variety of potential hazards that must be considered to ensure safe operations. These hazards are greater when the plutonium is in a form that is unsuitable for long-term storage, such as when it is in solution. Plutonium stabilization is important for both safety and cost reasons and is a high priority. The DNFSB has urged the Department to expedite stabilization of its plutonium materials in DNFSB Recommendations 94-1 and 2000-1 (DNFSB, 1994 and 2000) and, indeed, the Department itself has confirmed the need to perform this vital function in its own analyses (DOE, 1994). Execution of the 94-1 implementation plan to stabilize surplus plutonium has been underway since 1995. While much of that program has been completed, there have been delays and increased costs as a result of operational difficulties, unanticipated material characterization issues, and uncertainties in the development of appropriate stabilization technologies. Presently, program plans are being developed for completion of all milestones committed to the DNFSB.

Figure 3-2 The Department's Plutonium Complex in the Year 2000



As noted in Chapter 2, the Department has decided to pursue a modification of its previous plans for stabilization and storage of materials at SRS. The options that were considered and the results of the analysis that led to the Department's decision are described in this section.

Options for Optimizing Plutonium Stabilization at SRS

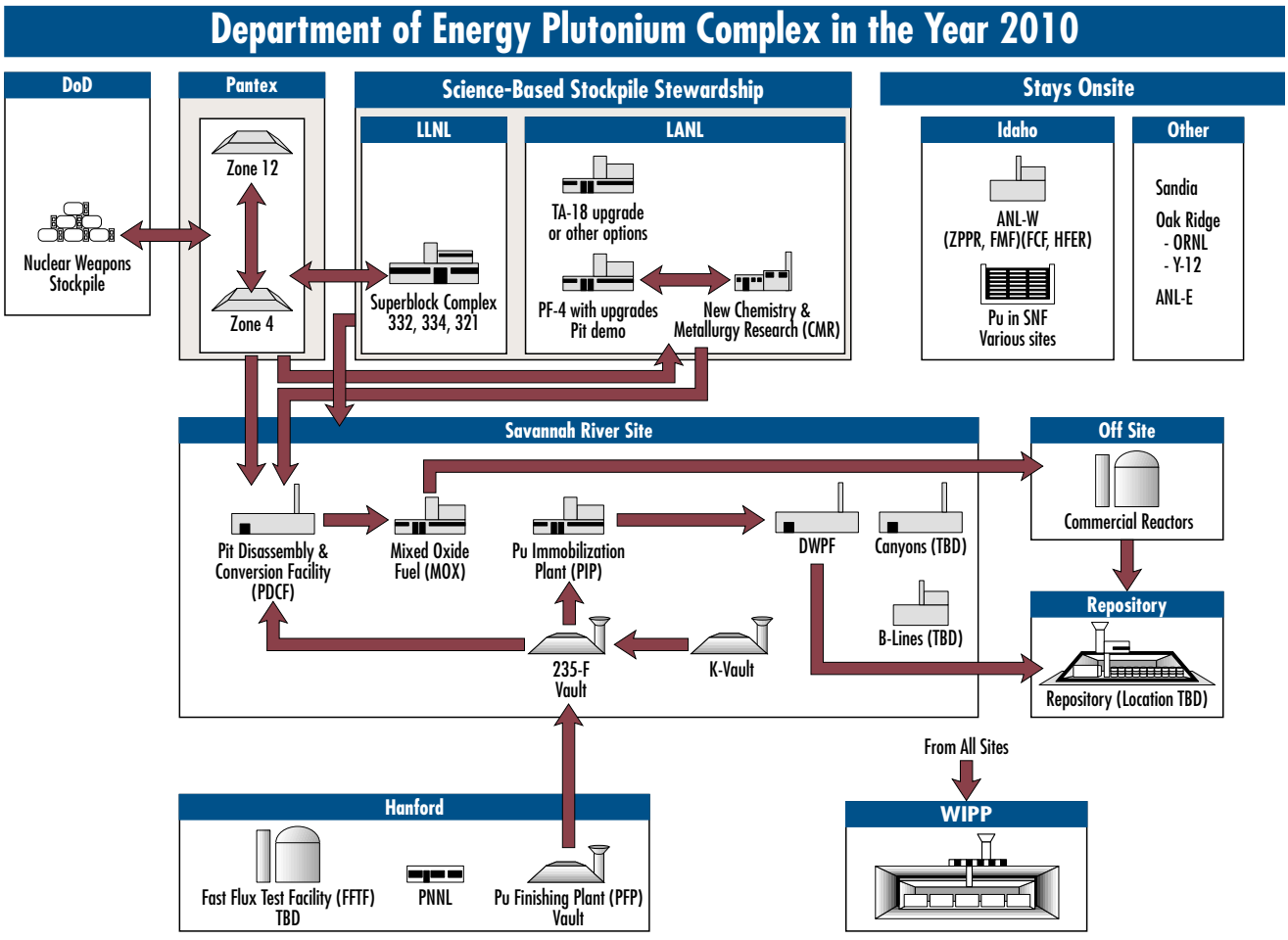
Following is an overview of how options for optimizing plutonium stabilization activities at SRS compared to each other. This overview illustrates many of the factors that influence integration decisions in the context of a large site within the nuclear materials complex.

Reference Option - Since 1994, the baseline approach to stabilizing plutonium materials at SRS involved optimum use of currently operating plutonium processing and storage facilities, along with construction of an Actinide Packaging and Storage Facility (APSF). This approach involved larger SRS operational costs than the current planning option described below because

Opportunities to Optimize Plutonium Management

- **Stabilization** – Determine if there are ways to optimize the Department's plans for stabilizing its inventory of surplus plutonium and achieve cost and risk improvement.
- **Storage** – Examine the Department's current interim and long-range plutonium storage plans to determine if the cost and risk associated with these plans can be reduced.
- **Disposition** – Configure plutonium facilities to take advantage of existing and planned infrastructure to achieve improved schedules, cost savings or avoidance, and other programmatic synergies.

Figure 3-3 The Department's Plutonium Complex in the Year 2010 (Based on Current Departmental Planning)



the reference option added the capital funding for construction of the new APSF to the cost of currently operating facilities.

The APSF was put on hold in December 1998 because the construction costs had increased several times and no project baseline had yet been established. Also, this approach did not consider new requirements or efficiencies that could be gained through integrated planning with the Department's program for plutonium disposition.

Current Planning Option – As a result of the Department's concerns with the APSF project, analyses were initiated to determine a more cost-effective, better integrated path forward. The approach which has been preliminarily decided upon maintains the existing SRS canyon strategy, which targets the early phase-out of F-Area plutonium-uranium extraction (PUREX) operations as in the reference option, but provides a new plutonium stabilization and packaging system (PuSPS) in building 235-F to convert SRS materials to a form meeting the Department's long-term storage standard. This approach allows SRS to stabilize its materials with fewer near-term costs than in the reference option, and with long-term costs consistent with current outyear funding projections. Stabilization activities in this case are projected to be complete by FY 2009.

Analysis of Stabilization Improvement Options

The options described above were assessed against the five criteria described earlier in this chapter.

(1) Reduce radiological risk – The current planning option completes stabilization of plutonium at about the same time as was projected for the reference option.

Potential Hazards of Improperly Stored Pu-239

- Container/packaging failures can contaminate personnel.
- Exposure of metal to air can cause oxidation and further degradation.
- Plutonium solutions can leak from tanks or piping.
- Corrosive or chemically reactive materials are difficult to contain.
- Old facilities that are poorly maintained or have obsolete designs exacerbate problems.
- Inadvertent accumulations of plutonium in sufficient quantities can result in nuclear criticality events and, thus, radiation emissions.

Criteria for Comparing Stabilization Improvement

- Reduce radiological risks.
- Reduce costs.
- Advance integration.
- Improve effectiveness.
- Further nonproliferation and arms control objectives.

(2) Reduce or avoid cost – By following the current planning option, the capability to package SRS materials to meet the Departmental storage standard can be accomplished via backfitting an existing facility (235-F) for less cost than building a "green field" facility (APSF).

(3) Advance integrated management of materials – One potential mission for APSF had been to assist in consolidated storage of several sites' plutonium at SRS. However, the benefits of that integration capability were not found to be adequate justification for the large capital investment, as further discussed below.

(4) Improve efficiency and effectiveness of operations – The Department has no need to proceed with APSF from a plutonium storage requirements basis, as discussed in the next section. The storage in the KAMS facility and building 235-F can accommodate planned receipts from Rocky Flats, LANL, and LLNL. Further, there appears to be no financial incentive [based on assumed Plutonium Immobilization Plant (PIP)startup] to accelerate relocation of Hanford materials.

(5) Further nonproliferation – The current planning option has the same canyon processing schedule as the reference option.

It is important to acknowledge that selection of this current planning option depends on many factors, including technology maturity, facility and operational readiness, funding availability, and other management decisions. The interface with decisions for improved storage is discussed in the next section.

Ways to Improve the Department's Management of Plutonium Storage

The Department's assessment of the need for expanded storage at SRS for stabilized material must be closely linked to the planned storage at the three MD facilities. The planned storage will accommodate the output product from the PDCF, input feed to the PIP, and MOX fuel fabrication facility.

Some storage at SRS would also be needed for the surplus pits shipped from Pantex, which would be converted to an oxide in the

PDCF before being manufactured into MOX fuel or immobilized. Also, storage would be needed for HEU disassembled from pits that would be ultimately fed back into other uranium streams.

The Department has already consolidated plutonium pits from Rocky Flats to Pantex in order to improve efficiency and reduce costs. The Department is implementing movement of Rocky Flats plutonium to SRS but is reviewing the plans for consolidation of Hanford's plutonium. The Department is evaluating whether to further consolidate materials from LANL and LLNL to SRS, if a cost-effective storage plan can be developed.

Table 3-1 identifies the projected number of "3013" cans containing plutonium metal and oxide items that will ultimately be shipped to SRS. The Department is analyzing several options for expanded plutonium storage at SRS.

Options for Improving Storage Plans

Modify existing storage facilities

The Base Case – This case provides for the shipment of Rocky Flats plutonium metal and oxides to the KAMS at SRS, starting in FY 2000. It includes only materials from Rocky Flats and materials at LANL and LLNL that were exchanged with materials from Rocky Flats. It does not include additional plutonium materials that are part of the scope of the MD program stored at Hanford, LANL, and LLNL.

Option A – Ship MD plutonium to SRS from LANL and LLNL, in addition to Base Case materials. MD program material (270 cans to KAMS) generated from ARIES and immobilization programs at LANL and LLNL would be shipped to SRS, in addition to the Base-Case shipments from Rocky Flats. This option is particularly important to MD because vault storage limitations and ongoing and future DP mission requirements for the LANL and LLNL vaults will preclude future shipment of plutonium to the laboratories until a path for storage of these materials is identified.

*Option A** – Same as Option A above, except that the LANL storage vault within TA-55's plutonium processing building would be modified to store surplus material generated at LANL in support of the MD program.

Option B – Ship plutonium to SRS from Hanford (4,000 items in "3013" cans). This would require modifying the building 235-F vault at SRS to provide up to 3,850 storage positions, but it would eliminate the need for upcoming modifications to Hanford's PFP vault and eliminate MD's need for 1-year storage capacity in the immobilization facility. In addition, when all nuclear material is removed from the PFP, significant safeguards and security costs could be saved.

The options above represent modifications to existing facilities for storage of excess plutonium metal and oxides. DP excess plutonium metal and oxides, 370 items in "3013" cans, under these scenarios would remain at LANL and LLNL until MD's PIP is built.

Table 3-1 Projected Plutonium Inventory and Proposed Shipment Schedule to SRS (expressed in number of items packed in Department Standard 3013 storage containers).

Site	No of 3013s	Shipments by Fiscal Year to SRS						
		2000	2001	2002	2003	2004	2005	2006-2014
Rocky Flats	1900		340	830	730			
Richland	4000							4000 (2010-2014)
Store in Plutonium Finishing Plant								1050 (2006)
Store in 235-F							500	1225 (2007) 1225 (2008)
LANL								
MD Material to SRS	220	80	70	70				
Store MD Material at LANL								
Rocky Flats Swap	96	60	36					
DP Excess	270							270 (2010)
Subtotal*	**586**							
LLNL								
MD Material	50		20	20	10			
Rocky Flats Swap	65	14	21	21	9			
DP Excess	100							100 (2010)
Subtotal	**215**							
SRS	1539							
TOTAL	**8240**							

* 100 cans of Pu-contaminated HEU also need to be moved out of LANL in 2000-2002 and 40 cans of Pu-contaminated HEU need to be moved out of LLNL in the 2001-2003 timeframe.

Build new storage facilities

The cost effectiveness of building new storage facilities has also been assessed. Options include:

Option C – Construct a new storage facility. A new storage facility with a storage capacity of 5,000 positions in conjunction with continued storage of 3,000 cans in the KAMS.

Option D – Construct a larger facility. A larger facility would have a 10,000 "3013" can capacity without KAMS storage.

The storage options identified above, Base Case plus Options A through D, are summarized in Table 3-2.

Costs of Options

Consolidation of Rocky Flats plutonium metal and oxides at SRS will begin this calendar year. Costs for consolidation of other surplus plutonium materials from the Department's other sites such as LANL and LLNL need to be evaluated and a decision made on interim storage at SRS.

In evaluating consolidation of Hanford material at SRS, the cost avoided from modifications to Hanford's PFP storage vault and elimination of the need for storage in the immobilization facility would approximate the costs of facility modification at SRS. Operating costs are essentially equal. Since it is estimated that no savings would be realized over the anticipated time period for interim storage of Richland plutonium metal and oxides at Savannah River, plutonium will remain in storage at Richland until the MD disposition facilities are operational and the materials can be delivered on a "just-in-time" (JIT) basis.

Construction of a new storage facility at SRS does not appear cost-effective at this time. If a new storage facility were built at SRS, and the MD immobilization facility began operating between 2006 and 2010, the new storage facility would only be needed for a 9- to 13-year period, at a significantly higher cost than use of existing facilities. If the MD immobilization facility is not built, however, the Department will need to construct a long-term storage facility at SRS. The cost analysis of each of these options is included in the Plutonium Storage Study to be issued in the near future.

Ways to Optimize Plutonium Disposition Facilities

In January 2000, MD completed the NEPA review of the various paths for disposition of surplus plutonium. Alternative locations for siting the three functions — Immobilization, Pit Disassembly and Conversion, and Mixed Oxide Fuel Fabrication — were studied, but the decision was made to locate functions at a single site, SRS. Figure 3-4 describes the capabilities required for surplus plutonium disposition.

Table 3-2 Comparative Summary of Consolidated Plutonium Storage Options

Storage Location	No. of Positions	Status	Base Case (RFETS Swap from LANL & LLNL)	Storage Option A (RF & DP JIT to PIP, Move MD Program Material	Storage Option A*	Storage Option B (DPJIT To PIP)	Storage Option C (Storage in KAMS & APSF)	Storage Option D
K Reactor Double Stack	3,000	Operational 2/00	RF 1900 SRS 939 LANL 96 LLNL 65 3000	RF 1900 SRS 939 LANL 96 LLNL 65 3000	RF 2200 SRS 639 LANL 96 LLNL 65 3000	RF 2200 SRS 639 LANL 96 LLNL 65 3000	RF 2200 SRS 639 LANL 96 LLNL 65 3000	
235-F Existing Vault	665	Operational	SRS 800	SRS 600 LLNL 50 650	SRS 600 LLNL 50 650			
K Reactor Triple Stack	Additional 1,400 positions	Pre-conceptual design complete		LANL 220*		LANL 220* LLNL 50* RL 750 1021		
235-F Vault Modifications	3,850	Pre-conceptual design complete				SRS 600 RL 3250 3850		
New Vault (5000 positions)	5,000	Final Design					5,000 (Richland, LANL, LLNL & SRS Material)	
Large New Vault	10,000	Concept						10,000

Base Case-3611 cans Option A-3881 cans Option B-7881 cans Options C&D-8251 cans JIT-Just in Time
*MD Program Material

The Department will apply value engineering practices during the design phase of each individual facility to determine the most effective manner in which to optimize it within the infrastructure at SRS to achieve improved schedules, secure cost savings, avoid future costs, and accomplish other programmatic synergies.

The Stewardship Task Force initially proposed a value engineering analysis covering the integration of some or all of the functions to be performed at these separate facilities in an attempt to achieve cost savings and other programmatic synergies. In considering this integrated concept, however, the Task Force accounted for two important factors: (1) integration could significantly limit programmatic, schedule, and operational flexibilities required for successful implementation of the plutonium disposition program; and (2) the U.S.-Russian plutonium disposition agreement undergoing final interagency review in both countries reflects the three-facility approach. In light of these factors, the Department believes that three individual, stand-alone facilities offer important insurance against technical, schedule, cost or institutional barriers; ensure the U.S. meets the terms of its potential bilateral agreement with Russia; and provide the best option for implementing the hybrid approach for plutonium disposition.

Optimizing Uranium Missions and Facilities

As described in Chapter 2, the Department currently maintains uranium materials in safe interim storage, with stabilization and blend-down as needed, pending their reuse in national defense or other programmatic applications or their disposition as surplus uranium. With respect to disposition, the Department prefers to maximize the reuse of surplus uranium materials to the extent that they meet, or can be processed to meet, specifications for commercial use. To date, detailed plans have been established for commercial reuse of surplus HEU only. For DU in the form of DUF_6, a long-term management strategy has been evaluated, although additional NEPA analysis will be required. Planning and evaluations are in the early stages for determining potential reuse or other disposition of U-233, LEU, and NU.

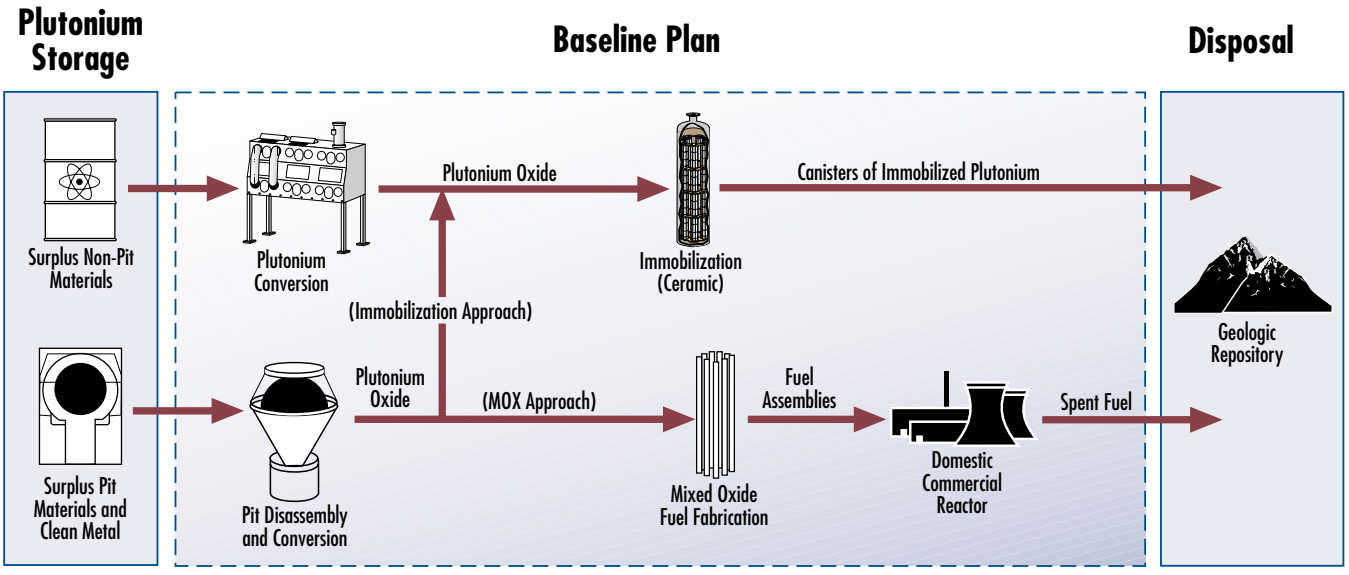
This section describes options for optimizing uranium missions and facilities in order to further integration and avoid future costs.

Ensure Adequate Uranium Processing/ Blending Facilities

HEU characterized as "national security" or "programmatic" is managed primarily at the Oak Ridge Y-12 Plant. These materials are classified shapes and must be made available for reuse in national security programs, or they are contained in the large backlog of nuclear materials awaiting recovery. As part of the manufacturing process, HEU is sometimes blended down to a lower assay of enriched uranium before being made into a final product. Such blending has been ongoing at the Y-12 Plant for many years.

Disposition of excess uranium materials includes the processing of HEU. Large inventories of uranium-bearing materials await processing to ensure that safe, reliable forms of uranium are available for reuse as reactor fuel or are in a form that is suitable for interim and/or long-term storage.

Figure 3-4 Surplus Plutonium Disposition Plans



Blending and processing achieve nonproliferation objectives consistent with U.S. nuclear materials policies. Maintaining uranium processing capability will support near-term, multi-program requirements including:

- weapons program/special projects,
- disposition of surplus HEU,
- production of research reactor fuel, and
- production of tritium fuel.

A rigorous options study will be completed by the Department. One option for location of this capability is at an upgraded Y-12 Plant at the Oak Ridge site. Other options include the H Canyon at SRS and commercial facilities owned by Nuclear Fuel Services and BWX Technologies.

A modernized enriched uranium processing facility would provide renewed capabilities for processing all forms of enriched uranium required for national security and other programs. A downsized, modern facility would function more cost-effectively, be seismically safe in its design and construction, and provide increased security at reduced costs. This facility could manufacture weapons components for the Stockpile Stewardship program, provide purified enriched uranium to the Department's domestic and foreign customers, and continue the recycling of enriched uranium-bearing salvage to optimize the Department's resources.

Consolidate Storage of Uranium Materials

Highly enriched uranium. The Department has approximately 174 MT of surplus HEU (1994 inventory) in a variety of physical forms such as metal, oxides, solutions, and spent nuclear fuel, at 10 sites in the United States. At present, a portion of this surplus has been down-blended, transferred from the Department, or relocated. The current total quantity and locations of HEU included in the national security reserve are classified.

Even though a viable and tested disposition path for surplus HEU is available through isotopic dilution and use as commercial LEU reactor fuel, we will have to store surplus HEU for many years to come. At present, excess material is stored at the Oak Ridge Y-12 Plant, together with the national security reserve. Also, surplus HEU from other sites is being consolidated at the Y-12 Plant, and additional HEU may be removed from the active weapons stockpile subject to implementation of future treaties.

Consolidation of HEU storage can accelerate site closures (e.g., at Rocky Flats) and produce considerable cost-savings. Safeguarding facilities is expensive. Thus, consolidating materials and reducing the number of facilities can reduce safeguards costs dramatically. Furthermore, facilities cannot be decontaminated and dismantled until nuclear materials have been removed. Currently, consolidation of HEU occurs on an ad-hoc basis, as a result of direct negotiations between shipper and receiver sites, usually in an effort to reduce costs at sites with smaller inventories and/or at sites having no defined use for the materials.

The fact that a new HEU Materials Storage Facility to support national security needs is in final conceptual design for the Y-12 Plant provides an opportunity to promote consolidation of HEU. The design studies include options for additional storage capacity. The Department will begin additional studies to evaluate the economics of expanding this facility to serve as a multi-program consolidation site for all excess non-spent nuclear fuel HEU. This study will be integrated with other consolidation activities, as maximum cost savings are not realized until all nuclear materials are removed from a facility and it is closed.

Low-enriched uranium, natural uranium, and depleted uranium. Approximately 85 percent of LEU/NU/DU materials do not have defined and/or agreed upon disposition paths. Possible disposition options include blending, either for disposal as LLW or potential commercial use. EM is conducting an analysis of management options for these materials. This analysis will be completed in the near future and will result in alternatives for these materials which will be evaluated through the NEPA process. The exception to this is the DU in the form of DUF_6. A DUF_6 program was announced by NE and is not considered further here.

The Department will analyze the value of processing its inventory of LEU for sale or blend-down purposes and will compare it with the cost of disposition, for materials for which disposal is an option.

Applying Proceeds from Material Sales Toward Implementation of Opportunities

Safe and secure management and disposition of nuclear materials over the next 10 years will cost billions of dollars. Some of these costs can be offset through material sales. This approach provides a common sense business model that can greatly benefit the Department and the taxpayer.

Managing excess property entails high surveillance and maintenance costs, but disposal requires a large up-front investment to achieve long-term savings or cost avoidance. The Secretary has made asset management and disposition a high priority and integration can yield further improvements. This

may include legislative reform that would establish a special account into which the Department would be permitted to deposit the proceeds from the sale/disposal of excess property rather than having those proceeds revert to the Treasury. Such reform would provide the Department and its contractors with more incentive to disposition excess property. The Department has used a similar approach to good effect in managing special isotope materials. The proceeds of isotope sales are returned to the Department to be used in the production of more isotopes.

Optimizing Transportation and Packaging Strategies

A major function of materials management is safe and timely transportation of nuclear materials and waste. The Department has been shipping waste and nuclear materials for years and has an excellent safety record. However, shipping campaigns, including packaging, can still be improved. The opportunities identified below would better coordinate shipping activities, coordinate planning of individual shipping campaigns, and elevate transportation to a corporate activity. The need for improvement is driven by the significant increase in transportation requirements in the near future.

It should be noted that national security shipments made by the Transportation Safeguards System (TSS) involve additional requirements and need to be considered separately from non-security shipments.

Coordinated Planning of Shipping Campaigns

Transportation planning must be coordinated across programs and sites. The lack of coordination leads to inefficient use of limited transportation resources, as well as a disjointed approach to stakeholder interactions associated with various shipping campaigns. Increased shipments of plutonium, uranium, spent nuclear fuel, and other materials will exacerbate this inefficiency over the next 5 years. Three activities could benefit the Department's shipment planning:

- **Transportation protocols.** The Department has undertaken an initiative to identify and evaluate the different shipping protocols and practices used by all Department shippers of radioactive materials and wastes. Where appropriate, it will establish standardized transportation protocols and practices, and where standardization is not appropriate, explain why not. Standard protocols and practices for all radioactive material and waste shipments are currently being drafted and reviewed by Department shipping programs and key stakeholders.

  This task is scheduled for completion by the end of Fiscal Year 2000. Benefits include good internal coordination regarding radioactive material shipments, better communication with stakeholders, and streamlined planning and preparation for future shipping campaigns.

- **Coordinating shipping model and shared costs.** Recent enhancements to transportation security and projected increases in shipments will strain existing transportation resources. This is especially the case for "out-of-commerce" national security shipments performed in the TSS. Significant opportunities exist for optimizing transportation across the Department by coordinating the planning and scheduling of shipments of national security materials and other nuclear materials.

  The Department is developing a modeling tool to help determine the best use of TSS resources to meet all secure shipping requirements. With minor modifications, this model has potential applicability to other nuclear material and waste shipments. To offset the increased resource requirements on the TSS, a financial chargeback approach will be implemented on non-national security shipments. The timing for integration is under development and will coincide with the FY 2002 budget cycle.

Packaging Management

To successfully execute a shipping campaign, programs must begin the planning process early. Many of the steps that are key to implementing such a campaign are lengthy and require a long-range plan. Identifying packaging suitable for shipping a nuclear material is one of the critical steps in this process. Packaging certification must be accommodated and optimized to avoid operational delays.

Packaging

Packaging management consists of a number of components, many of which contain opportunities for improvement. The components include:

- Material characterization and hazard classification is based on the material's physical (solid, liquid, gas) and chemical forms, radiological hazards, the quantity to be transported, and the U.S. Department of Transportation hazard classification.
- Packaging type (strong-tight, industrial, Type A or B fissile packagings), where the robustness of the packaging is determined by the hazard of the materials.
- Packaging design, which addresses the specific packaging type and is described in a Safety Analysis Report for the packaging.

- Packaging fabrication, during which a qualified packaging fabricator is identified to manufacture the packaging to meet client needs.
- Packaging inventory, warehousing, and tracking, which address the location of the packaging and logistics for delivery to a central location or for pickup by carrier.
- Packaging maintenance, which addresses who maintains packagings, the frequency they are serviced, and acceptance criteria for continued use of packaging.
- Quality assurance, which identifies the appropriate quality assurance programs for each of the above elements and the standard to be met (the Department's, ASME, ISO), and the response to failure to meet any element of a quality assurance program.
- Packaging certification, which determines if the packaging meets the regulatory requirements prior to fabrication.

An evaluation of the components of packaging management will be completed by October 2000 and will present recommendations for program and process efficiencies and improvements. Additionally, the Department will establish a Department-wide Package Management and Planning Working Group, which will oversee the development of new packaging and the use of existing packagings. Further, this group will, to the extent practicable, identify areas where inefficiencies caused by duplication of packagings and resources can be eliminated.

Standardize Packaging

Currently, each Departmental program that ships nuclear materials develops its own packaging. Sometimes different sites within a program develop and/or purchase a different packaging. This packaging is costly, and it is designated for use only by the site or program that paid for it. Smaller sites can be left out of the planning for packaging use, causing potential delays in closure schedules. With individual sites and programs owning this packaging, defining who performs maintenance and determining reuse often becomes a problem. A corporate approach to packaging could leverage savings through larger procurements and maintenance of containers.

To make this process more efficient, the Department will take the following actions:

- *Establish multi-use packaging criteria.* Programmatic decisions to expand the use of containers, making them multi-application containers, would reduce the total number that the Department needs to buy and maintain. Two multi-use packagings are now being developed: one for plutonium materials and one for spent nuclear fuel and HLW. Building on this concept, all material to be disposed of will be reviewed against multi-use packaging criteria. Where it is possible to easily modify existing containers, rather than creating and certifying new packaging, the Department will accomplish this.
- *Shift packaging ownership to programs or site material management groups.* Packaging is currently owned by sites. This causes disputes over who gets to use the container and when. It slants certification toward use by the site that owns it. The shipping needs of small sites with limited resources may be a low priority. Transferring ownership of packagings to a program or a nuclear materials management group could produce efficiency in purchasing and resource management. Similar to the approach being used for resource management of the TSS, resource management of the packaging fleet should also be considered. Programmatic fleet management could reduce shipment costs by reducing the number of containers that would have to be purchased, increasing the efficiency of fleet management by gaining greater use from each container and rotating maintenance to limit packaging down-time.

Overall, the focus of these opportunities is on doing business in a more corporate fashion and making better use of resources across the Department.

Optimizing Technology Investments

Technology development within the weapons complex has traditionally involved "suppliers" in the form of the laboratories, and "customers" in the form of program offices. In very general terms, the needs of each customer were unique, and R&D was assigned either to a laboratory that competed successfully for the work, or to an informally recognized center of excellence. In addition, the production sites had "process development" organizations that fine-tuned the production, recovery, and manufacturing processes devised by the major laboratories.

The transition from yesterday's weapons production focus to today's much more diverse mission set, represented by multiple programs, has created a situation in which customers may have overlapping needs. Also, technological expertise is much more diverse and is spread among several laboratories.

Today, the customers are the programs and projects in the various program Secretarial Offices. In many cases, overlapping needs are evident. The technology "suppliers" continue to be the national laboratories and process development groups at the sites. "Centers of excellence" exist for technology development. These include national laboratories and sites, such as Rocky Flats and the Savannah River Technology Center at SRS. As a consequence, the possibility of duplicative effort has arisen.

To assess the extent of overlapping initiatives, the Department reviewed the many program documents identified in Chapter 2 to comprehensively identify technology requirements and impacts. Examples of current efforts that are integrated opportunities for

improved integration, and a management structure to foster improved integration are described below.

Documentation of Department technology requirements and plans

Many Department documents outline technology requirements and R&D plans for executing missions. Some of the documents are still in draft form, but they are a good source of information about the Department's principal technology initiatives.

For example, the DOE FY 2000 Research and Development Portfolio provides a comprehensive list of current Department R&D activities and budgets. Future versions will reflect technology roadmapping, which will provide a more comprehensive framework for technology integration.

By analyzing these sources, several areas of technology development and core competencies common to multiple Departmental program offices were identified. Table 3-3 shows the main areas of overlapping interests.

Technology integration

There are several examples of integration associated with the broad areas identified in Table 3-3. One is related to development of safe storage standards for nuclear materials. The latest revision of DOE-STD-3013 for long-term storage of plutonium metal and oxide is a cooperative effort among DP, EM, and MD. In another example, the Department's National Transportation Program and the Nuclear Materials Stewardship Technology Program (EM) have created a Hydrogen Generation Working Group to facilitate communication, reduce duplication, and enhance synergy among researchers investigating the generation of hydrogen gas in radioactive materials. Ultimately this will benefit every program that stores or transports gas-generating nuclear materials, including wastes.

A number of integrating mechanisms have been established over time. Laboratory managers involved in analytical chemistry have formed a working group among the sites involved in large-scale analytical operations to compare initiatives and share ideas. This group, the Department Analytical Managers, has been meeting annually for 16 years. Professional conferences and symposia provide a forum for technical peer reviews and foster collaborative relationships.

Significant near-term opportunities

With the diversity and complexity of Departmental programs and technology initiatives, more can and should be done to increase technology integration. For nuclear instrumentation, the Office of Defense Nuclear Nonproliferation is concerned with development of improved and more automated safeguards and security systems that DP, EM, and MD can use in nuclear materials storage facilities. All programs would benefit if collaboration among programs allowed sites to use their own facilities as a test bed for new instruments.

For storage surveillance and monitoring, as various programs package material for long-term storage,

Table 3-3 Overlapping Technology Development Interests

Technology Development Areas	Organization
Nuclear Instrumentation, Measurements, NDA/NDE Technology Development	DP, EM, MD, NN, SO, SC
Chemical Processing Technology Development (aqueous, pyrochemistry, immobilization, waste minimization)	DP, EM, MD, NE, SC
Analytical Chemistry Development	DP, EM, MD, NE
Materials Science/Materials Characterization	DP, EM, NE, SC
Separations Technology Development	DP, EM, NE
Nuclear Material Packaging, Storage, Monitoring and Surveillance Technology	DP, EM, MD, NE
Spent Fuel Packaging, Storage, Monitoring and Surveillance Technology	EM, NR, RW
Robotics/Automation	DP, EM, MD, NE

surveillance approaches and technologies should be integrated. For waste minimization, emerging requirements to reduce waste volumes and lower the actinide content of wastes would have a significant impact on the technologies used to handle nuclear materials. Although some programs have been organized to address this initiative, further integration would pool resources so they could be used more effectively.

Management structure to improve technology integration

The process already initiated to develop and maintain the R&D portfolio will play an important role in providing a framework for technology integration. The Department's R&D Council, composed of key principal secretarial officers and chaired by the Under Secretary for Energy, Science, and Environment, oversees the portfolio and directs technology policies and priorities.

The NMC will charter a Nuclear Materials Stewardship Task Force Working Group to focus attention on opportunities to better integrate nuclear materials technology initiatives. This will more closely couple technology initiatives with mission drivers, ensure that the technology initiatives are relevant, and provide the best forum for prioritizing the integrated technology investments.

This working group will be staffed by members assigned by the Stewardship Task Force to identify the needs of various customers, and, with their help, to prioritize those needs. The working group will assess the capabilities of the various suppliers and coordinate their related programs. Finally, the working group will recommend funding for cost-effective nuclear materials-related R&D focused on meeting mission objectives. This approach can leverage R&D funding, minimize cost, eliminate gaps and overlaps, and identify high-return-on-investment opportunities.

While it is not yet possible to estimate cost savings from better coordination and integration of technology initiatives, there is a significant potential for pooling of resources.

Summary of Proposed Operational Improvements

The Department has identified a number of near-term actions that promise to strengthen and integrate management of nuclear materials. Implementing them can help ensure that the treatment, storage, and disposition of nuclear materials will be managed economically and efficiently, and that the nuclear materials complex will be adequately prepared to meet mission requirements over the coming decades.